# INTERNATIONAL STANDARD

# IEC 60684-2

1997

AMENDMENT 2
2005-11

Amendment 2

## Flexible insulating sleeving –

## Part 2: Methods of test





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# FOREWORD

This amendment has been prepared by IEC technical committee 15: Standards on specifications for electrical Insulating materials.

The text of this amendment is based on the following documents:

| FDIS | Report on voting |
|---|---|
| 15/224/FDIS | 15/255/RVD |

Full information on the voting for the approval of this amendment can be found in the report on voting indicated in the above table.

The committee has decided that the contents of this amendment and the base publication will remain unchanged until the maintenance result date indicated on the IEC web site under "http://webstore.iec.ch" in the data related to the specific publication. At this date, the publication will be

- reconfirmed,
- withdrawn,
- replaced by a revised edition, or
- amended.



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CONTENTS



Add the following new clauses:



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Add after Clause 50, introduced in Amendment 1, the following *new Clauses 51 through 57:*

## 51 Dynamic shear at ambient temperature

### 51.1 Principle

This test is designed to evaluate the strength of dual wall sleevings under shear conditions when bonded to an aluminium substrate.

### 51.2 Apparatus

Aluminium strips (100 ± 5) mm x (25 ± 1) mm x (0,9 ± 0,1) mm.

Degreasing solvent: 2-Butanone (methyl ethyl ketone)

Specimen assembly fixture (see Figure 16)

Silicone release paper

320 grit abrasive

Tensile test machine

Oven (for method 52, dynamic shear at elevated temperature)

Weight and Mass 1,4 kg ± 0,1 kg.

Suitable weight to flatten specimens.

### 51.3 Form and number of test specimens

Three test specimens shall be prepared. Three strips of aluminium shall be abraded and degreased on one side on a length of at least 20 mm from one end. Three lengths of sleeving at least 120 mm long shall be recovered in an oven for the time and temperature as specified in IEC 60684-3. Immediately after removal the sleeving shall be cut open longitudinally and laid flat on the silicone release paper, with the inside coated surface in contact with the silicone paper. A weight of sufficient mass to keep the specimens flat shall be placed on top. This assembly shall be allowed to cool to room temperature before the weight is removed. Any other suitable method for flattening the sleeving may be used.

The three specimens of the sleevings shall be finally cut longitudinally (100 ± 5) mm × (25 ± 1) mm.

The aluminium strips and cut sleeving specimens shall be assembled as shown in Figure 16, with the coated surface of the sleeving in contact with the abraded surface of the aluminium, overlapped between 12,5 mm and 14,2 mm. The weight with mass 1,4 kg shall be preconditioned in an oven for at least 1 h at the assembly conditioning temperature as specified in IEC 60684-3. The whole assembly, as shown in Figure 16, shall be placed in an oven for the time and temperature as specified in IEC 60684-3. The assembly shall then be removed from the oven and allowed to cool to room temperature before the weight is removed.

### 51.4 Procedure

Insert the specimen in the tensile test machine by clamping at least 25 mm of the aluminum strip in the top jaw and at least 25 mm of the sleeving in the bottom jaw. The rate of jaw separation shall be (50 ± 5) mm/min. Record the maximum load for each specimen.

### 51.5 Result

The result shall be the mean of the three maximum loads.

*Dimensions in millimetres*

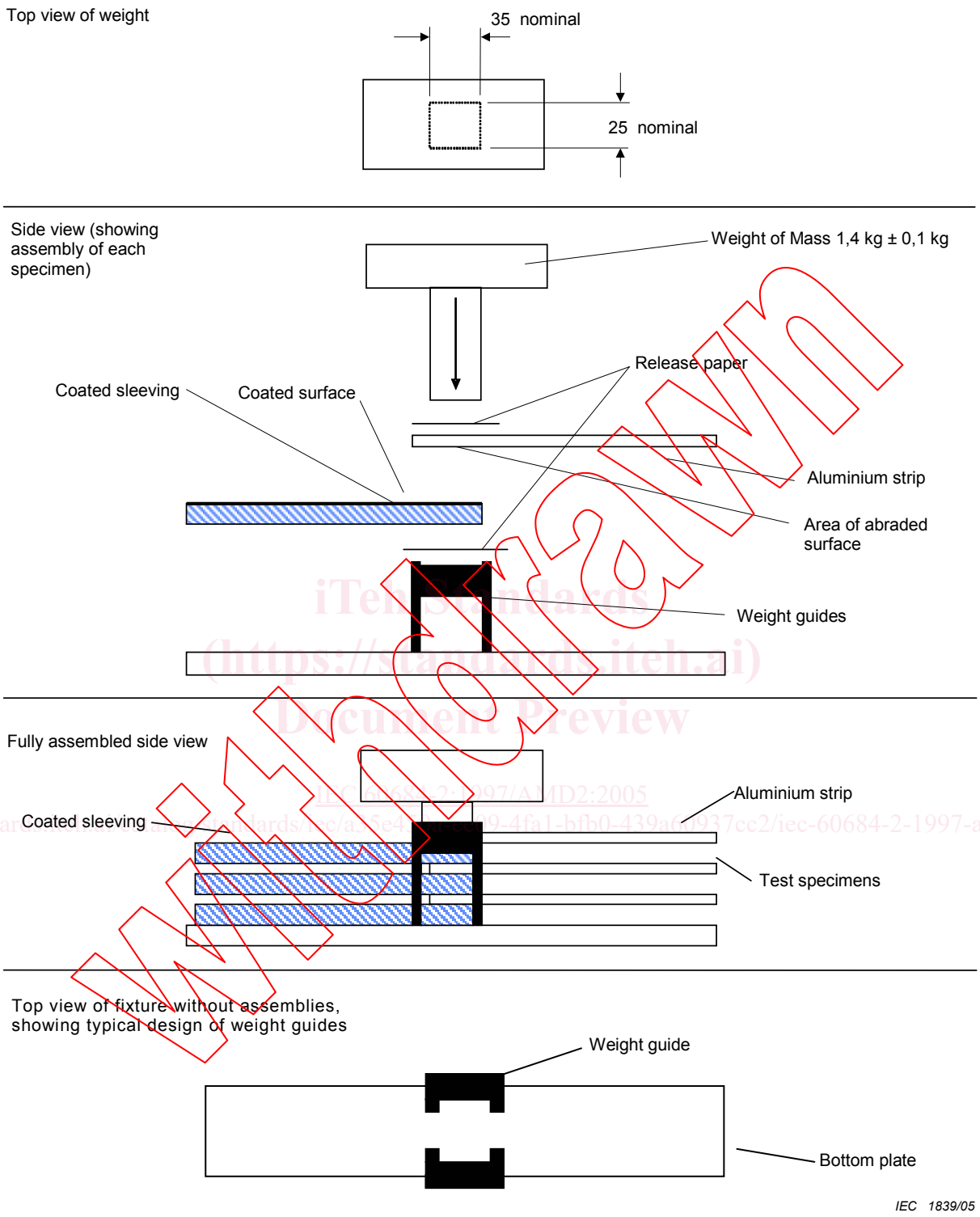





**Figure 16 – Assembly and fixture for dynamic shear at ambient temperature**

## 52 Dynamic shear at elevated temperature

The test specimens shall be prepared in accordance with 51.3.

The procedure shall be in accordance with 51.4 except that the test is performed in an oven mounted in the tensile test machine. The test specimens shall be pre-conditioned in the test oven and at the temperature of test for at least 30 min. The test temperatures shall be as specified in IEC 60684-3.

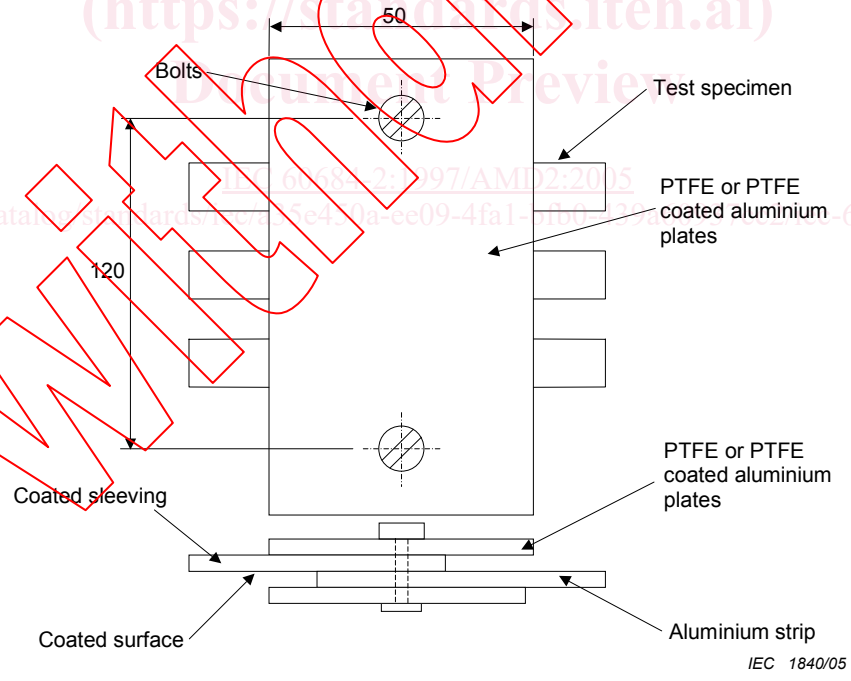
## 53 Dynamic shear after heat shock and heat ageing

The test specimens shall be prepared in accordance with 51.3.

The test specimens shall be sandwiched between two PTFE or PTFE coated aluminium plates as shown in Figure 17 with the bolts just sufficiently tight enough to ensure the specimens remain flat during the heat shock or heat ageing periods. The assembly shall be conditioned in an oven for the time and temperature specified in IEC 60684-3. The test specimen shall be removed from the oven and allowed to cool to room temperature before they are removed from the aluminum plates.

The test specimens shall then be tested in accordance with 51.4.

*Dimensions in millimetres*




NOTE Dimensions are nominal unless otherwise specified.

**Figure 17 – Assembly for heat shock and heat ageing**

## 54 Rolling drum peel to aluminium

### 54.1 Principle

This test is designed to evaluate the strength of dual wall sleevings under peel conditions when bonded to an aluminium substrate.

### 54.2 Apparatus

Aluminium tube with outside diameter of (9,5 ± 0,25) mm, approximately 35 mm long

Degreasing solvent: 2-Butanone (methyl ethyl ketone)

Free rolling drum (see Figure 18)

Paper or adhesive masking tape

320 grit abrasive

Tensile test machine

Oven

### 54.3 Form and number of test specimens

Three test specimens shall be prepared. Abrade the aluminium tubes with the 320 grit abrasive and then degrease with methyl ethyl ketone. Fix a narrow strip of adhesive masking tape longitudinally on the aluminium tube. Cut lengths of sleeving (25 ± 1) mm long and position centrally over the aluminium tube and condition in an oven for the time and temperature as detailed in the IEC 60684-3, by suspending horizontally. Remove the test specimens from the oven and allow to cool to ambient temperature. Cut longitudinally along the edge of the paper or adhesive tape and lift to provide a flap of material.

### 54.4 Procedure

Measure the width of the sleeving to the nearest millimetre on the aluminum tube. Insert the rolling drum into the aluminum tube of the test specimen. Clamp the rolling drum support into the bottom grip of the tensile test machine and the flap of material into the upper grip. Pull the test specimen apart at a constant rate of (50 ± 5) mm/min. (Figure 18)

Record the peel force in newtons over the entire peeling operation. Calculate the average peel force by ignoring the first and last 10 % of the peel trace, take 5 readings at equal distances apart from the remainder of the peel trace, add together and then divide by 5.

Calculate the peel strength using the following formula.

$$\text{Peel strength (N/25 mm)} = \frac{\text{Average peel force (N)} \times 25}{\text{Sleeving width (mm)}}$$

### 54.5 Result

The result shall be the mean of the three peel strengths.